

所別：太空科學研究所碩士班 科目：流體力學

1. Explain the following terms: (20%)
  - (a) potential flow.
  - (b) Joukowski theorem.
  - (c) streamline, path line and streak line.
  - (d) Kelvin's circulation theorem.
  - (e) Reynolds number.
  
2. (a) What does an ideal fluid mean? (4%)  
(b) Write down the governing equation for an ideal fluid and explain the physical meaning of each equation. (10%)
  
3. An infinite cylinder (radius is  $R$ ) moving perpendicular to its axis in an incompressible ideal fluid (speed is  $V_0$ ). Determine the velocity of potential flow past this cylinder. (20%)
  
4. Suppose that a semi-infinite region of stationary Newtonian viscous fluid is bounded by a rigid plane (at  $y=0$ , say) which is suddenly given a velocity  $V_0$  in its own plane and thereafter maintained at that speed. Drive the velocity distribution  $V(y,t)$ . (20%)
  
5. (a) Write down the equations of motion for two dimensional laminar boundary layer. (8%)  
(b) Show that the thickness ( $\delta$ ) of the boundary layer diminishes with increasing Reynolds number ( $R$ ) as  $\frac{1}{\sqrt{R}}$ . (ie.  $\delta \propto \frac{1}{\sqrt{R}}$ ) (9%)  
(c) Show that the thickness ( $\delta$ ) of the boundary layer in the flow along a plate increases as the square root of the distance ( $x$ ) from the edge. (ie.  $\delta \propto \sqrt{x}$ ) (9%)

參考用